

TOMATO MOSAIC VIRUS

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Mosaic disease of tomato was recognized as being caused by an infectious agent as early as 1908 (1). However, experiments attempting to demonstrate transmissibility of the causal agent into tobacco produced conflicting results (1). It is now known that tomato mosaic is caused by a number of serologically related strains of tomato mosaic virus (ToMV) closely related to but distinct from common tobacco mosaic virus (TMV) (4).

Significant losses can occur in fresh-market tomato production. Early infection, especially at transplanting, results in the greatest losses due to reduced yield, size and quality of fruit (2).

SYMPTOMS: Symptoms of infection vary with virus strain, tomato cultivar, time of infection and environmental conditions. Symptoms may be observed on leaves, stems or fruit. Plants become stunted. Leaves may be mottled, crinkled, corrugated, string-like, or curled. Stems may develop necrotic streaks. Generally, fruits show no symptoms although more severe ToMV strains can cause internal browning, necrotic pitting or severe mottling (5).

DISEASE DEVELOPMENT: Contaminated seeds and infested plant debris with ToMV serve as primary sources of inoculum (2). Seeds generally carry the virus on their coat. Although some virus may be carried within the seed, the actual embryo, or immature seedling has never been found systemically infected. Initial infection usually occurs with transplanting. Mechanical abrasion of seedlings provides openings for entry of virus particles associated with contaminated seed and soil. As with TMV, ToMV is a very persistent virus, surviving in leaf and root debris for more than 2 years (2).

The most important means of ToMV spread is undoubtedly associated with handling of the plants. Workers tying, pruning, cultivating and harvesting, pick the virus up on their hands, tools, and clothing. Although insects are not considered vectors of this virus, they are capable of spreading the virus with their normal activity as could any animal or bird.



Fig. 1. Tomato mosaic virus. **A)** Mild mottle on tomato leaf. **B)** Severe mottle on tomato and pepper fruits. (Photo courtesy of T. Kucharek)



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CONTROL: Prevention is the best control for ToMV.

1. Reduce primary inoculum by using treated seed. Eliminate virus on the seed-coat by soaking seed in a 10% tri-sodium orthophosphate (TSOP) solution for 20 minutes. Internal seed-borne ToMV can be eliminated by heat treating air-dried (not moist) seed at 158°F from 2 to 70 days. The longer treatments are more effective for virus reduction and have little effect on germination as long as ventilation is maintained (5).
2. Avoid planting in soil where tomato, pepper, tobacco or other solanaceous crops have been grown within the past two years.
3. Avoid transplant damage. Seed directly or set out plants started in partitioned plastic containers or individual fiber pots.
4. Avoid smoking in tomato fields. Workers should wash their hands before handling the crop and avoid placing tools in pockets where tobacco may be kept.

Reduce secondary spread using a combination of practices.

1. Rogue symptomatic plants.
2. Clean hands frequently. Simple soap and water will not do the job. It is extremely difficult to remove ToMV from the hands. Wash and scrub hands with a brush using 3% TSOP and paying special attention to under the nails. Rinse well with running water.
3. Clean tools frequently. Tools can be heat sterilized or soaked 30 minutes in 3% TSOP without rinsing.
4. Much reference has been made to ToMV inactivation using milk applications. Spraying plants to run-off with a skim milk solution prior to handling, plus dipping hands and tools frequently in milk solution, have been attributed to prevention and delay of ToMV spread.
5. Wash clothing frequently. Workers should be aware that the virus may be carried on footwear and hair (2).

Effects of infection can be minimized by several means.

1. Plant ToMV resistant varieties. There are a number of available cultivars.
2. Inoculation of seedlings with a weak strain of the virus may protect the plant from infection by more severe strains.

SURVEY AND DETECTION: Susceptible crops include tomato, pepper and other solanaceous crops.

Symptoms on tomato are extremely variable. Leaf symptoms include mosaic, yellow-mottle, crinkling, corrugation or strapping. Symptoms often become less severe as the plant ages (2). Stems and petioles may develop necrotic, longitudinal streaks, possibly killing the plant.

Symptomatic sweet-pepper plants may be stunted or show severe stem, petiole and leaf necrosis. Leaves often abscise.

ToMV is a member of the tobamovirus (tobacco mosaic virus) group. Virus particles of this group are typically rigid and rod-shaped, approximately 300nm long. ToMV induces cytoplasmic inclusions of hexagonal plate form (3). Inoculation of ToMV infected sap onto *Nicotiana glutinosa* L. at or below 33°C should produce .5mm to 4mm diameter necrotic local lesions. For positive identification of viral infections, symptomatic samples should be submitted to a plant disease laboratory.

LITERATURE CITED

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